

Meningococcal Disease and Meningococcal Vaccines

**Epidemiology and Prevention of Vaccine-
Preventable Diseases**

**National Center for Immunization and
Respiratory Diseases
Centers for Disease Control and Prevention**

Revised March 2012

Note to presenters:

Images of vaccine-preventable diseases are available from the Immunization Action Coalition website at <http://www.vaccineinformation.org/photos/index.asp>

Neisseria meningitidis

- ❑ **Severe acute bacterial infection**
- ❑ **Cause of meningitis, sepsis, and focal infections**
- ❑ **Epidemic disease in sub-Saharan Africa**
- ❑ **Current polysaccharide vaccine licensed in 1978**
- ❑ **Conjugate vaccine licensed in 2005**

Neisseria meningitidis

- ❑ **Aerobic gram-negative bacteria**
- ❑ **At least 13 serogroups based on characteristics of the polysaccharide capsule**
- ❑ **Most invasive disease caused by serogroups A, B, C, Y, and W-135**
- ❑ **Relative importance of serogroups depends on geographic location and other factors (e.g. age)**

Meningococcal Disease Pathogenesis

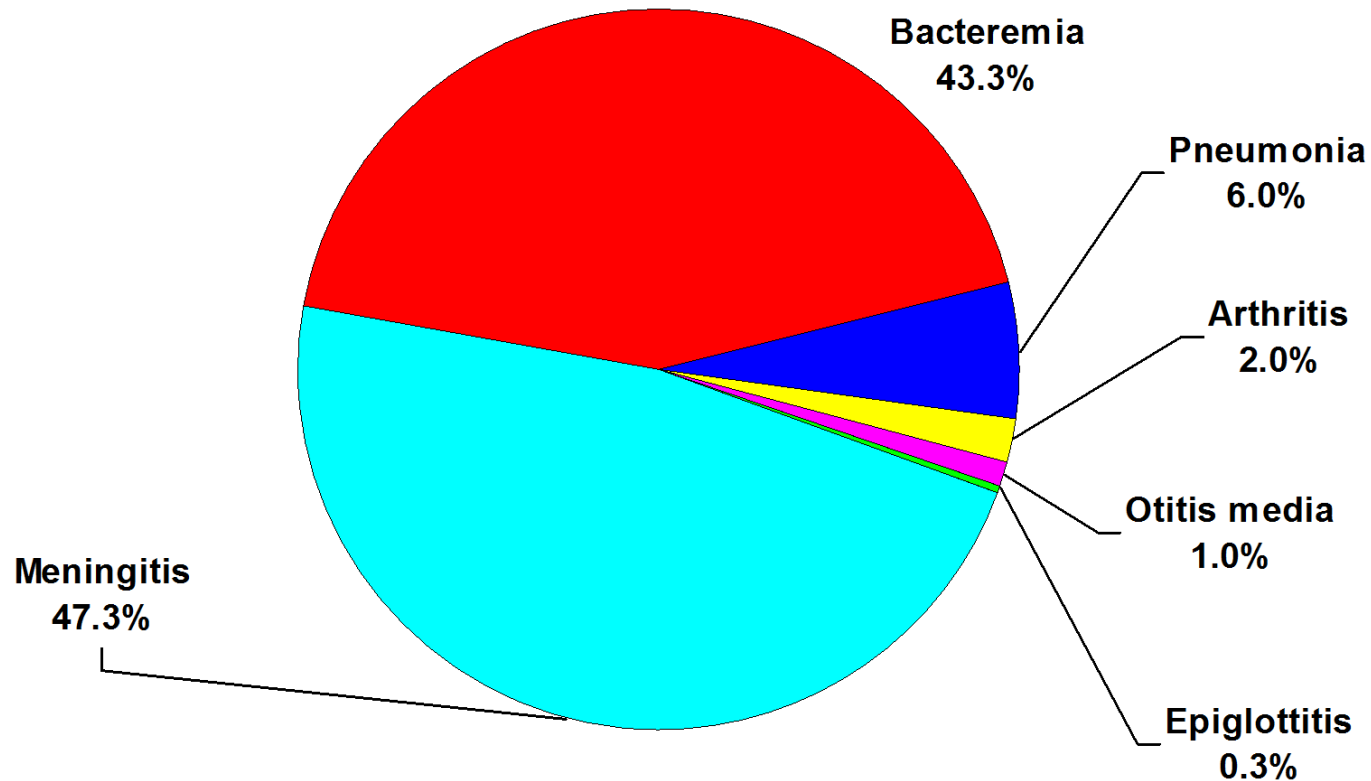
- ❑ **Organism colonizes nasopharynx**
- ❑ **In some persons organism invades bloodstream and causes infection at distant site**
- ❑ **Antecedent URI may be a contributing factor**

Meningococcal Disease Clinical Features

- ❑ Incubation period 3-4 days (range 2-10 days)**
- ❑ Abrupt onset of fever, meningeal symptoms, hypotension, and rash**
- ❑ Fatality rate 9%-12%; up to 40% in meningococemia**

Neisseria meningitidis

Clinical Manifestations*



***1992-1996 data**

Meningococcal Meningitis

- ❑ **Most common pathologic presentation**
- ❑ **Result of hematogenous dissemination**
- ❑ **Clinical findings**
 - fever
 - headache
 - stiff neck

Meningococemia

- ❑ **Bloodstream infection**
- ❑ **May occur with or without meningitis**
- ❑ **Clinical findings**
 - fever
 - petechial/purpuric rash
 - hypotension
 - multiorgan failure

Neisseria meningitidis

Risk factors for invasive disease

❑ Host factors

- Terminal complement pathway deficiency
- Asplenia
- Genetic risk factors

❑ Exposure factors

- Household exposure
- Demographic and socioeconomic factors and crowding
- Concurrent upper respiratory tract infection
- Active and passive smoking

Meningococcal Disease Laboratory Diagnosis

- ❑ **Bacterial culture**
- ❑ **Gram stain**
- ❑ **Non-culture methods**
 - Antigen detection in CSF
 - Serology

Neisseria meningitidis

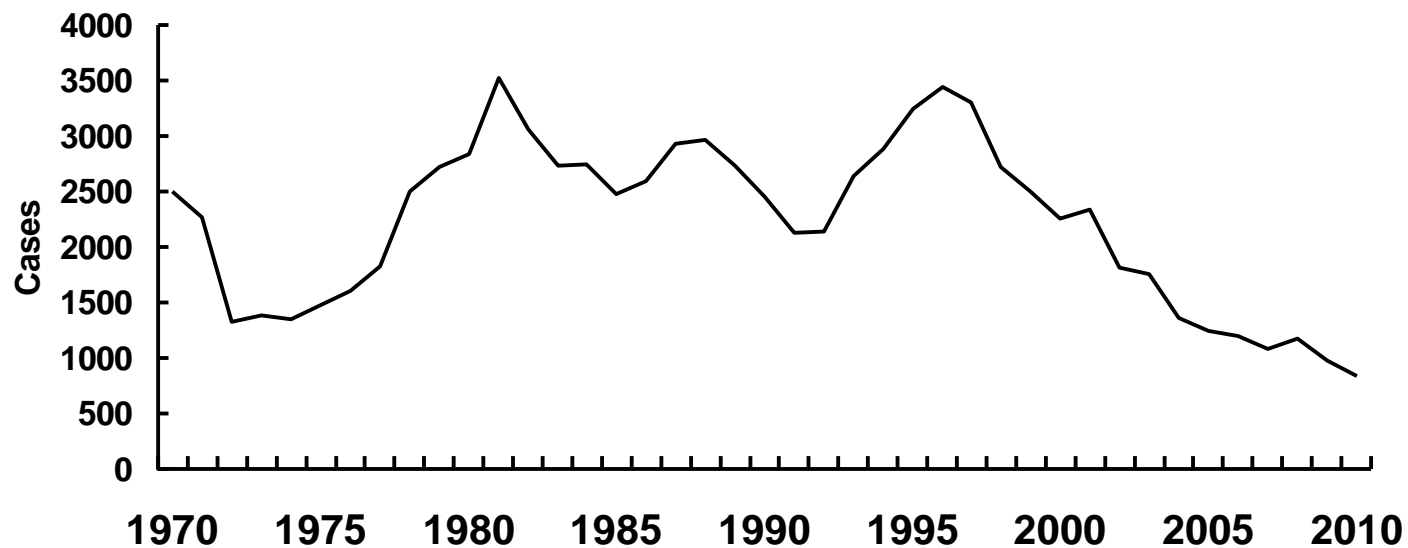
Medical Management

- ❑ **Initial empiric antibiotic treatment after appropriate cultures are obtained**
- ❑ **Treatment with penicillin alone recommended after confirmation of *N. meningitidis***

Meningococcal Disease Epidemiology

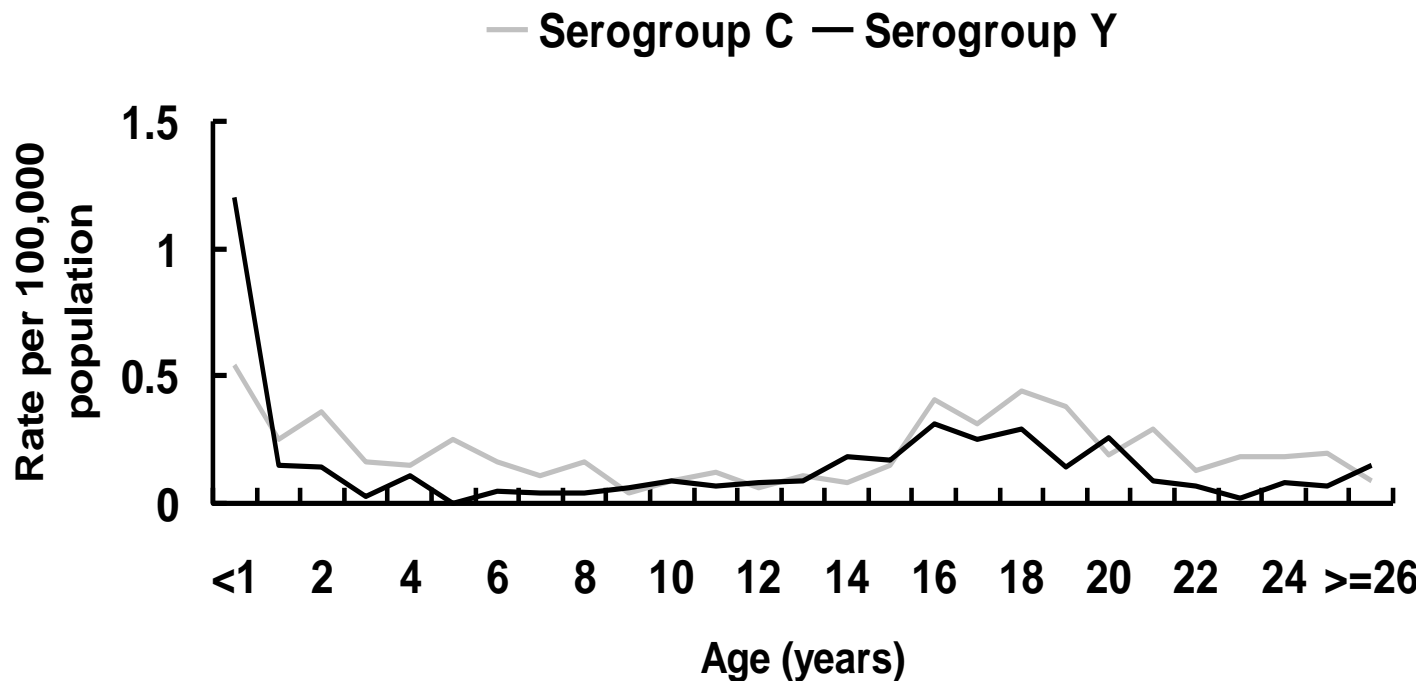
- | | |
|---------------------------|---|
| ❑ Reservoir | Human |
| ❑ Transmission | Respiratory droplets |
| ❑ Temporal pattern | Peaks in late winter–
early spring |
| ❑ Communicability | Generally limited |

Meningococcal Disease – United States, 1972-2010*



*all serogroups

Rates of Meningococcal Disease by Age, United States, 1999-2008



Source: CDC Active Bacterial Core Surveillance

Meningococcal Disease in the United States

- ❑ **Distribution of cases by serogroup varies by time and age group**
- ❑ **In 1997-2002:**
 - 25% serogroup B
 - 31% serogroup C
 - 37% serogroup Y
 - 65% of cases among children <1 year of age due to serogroup B (2001)

Meningococcal Disease Among Young Adults, United States, 1998-1999

❑ 18-23 years old	1.4 / 100,000
❑ 18-23 years old not college student	1.4 / 100,000
❑ Freshmen	1.9 / 100,000
❑ Freshmen in dorm	5.1 / 100,000

Meningococcal Outbreaks in the United States

- ❑ Outbreaks account for less than 5% of reported cases**
- ❑ Frequency of localized outbreaks has increased since 1991**
- ❑ Most recent outbreaks caused by serogroup C**
- ❑ Since 1997 outbreaks caused by serogroup Y and B organisms have also been reported**

Meningococcal Polysaccharide Vaccine (MPSV)

- ❑ **Menomune (sanofi pasteur)**
- ❑ **Quadrivalent polysaccharide vaccine (A, C, Y, W-135)**
- ❑ **Administered by subcutaneous injection**
- ❑ **10-dose vial contains thimerosal as a preservative**

Quadrivalent Meningococcal Conjugate Vaccine (MCV4)

- ❑ **Menactra (sanofi pasteur)**
- ❑ **Menveo (Novartis)**
- ❑ **Both vaccines**
 - quadrivalent (A, C, Y, W-135) conjugated to diphtheria toxoid (Menactra) or CRM₁₉₇ (Menveo)
 - administered by intramuscular injection
 - approved for persons 2 through 55 years of age

MPSV Recommendations

- ❑ Approved for persons 2 years of age and older**
- ❑ Not recommended for routine vaccination of civilians**
- ❑ Should be used only for persons at increased risk of N. meningitidis infection who are 56 years of age or older, or if MCV is not available**

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MCV4 Vaccination Recommendations

- ❑ Administer MCV4 at age 11 or 12 years with a booster dose at 16 years of age**
- ❑ Administer 1 dose at age 13 through 15 years if not previously vaccinated**
- ❑ For persons vaccinated at age 13 through 15 years administer a 1-time booster dose is recommended, preferably at or after 16 through 18 years of age**
- ❑ Healthy persons who receive their first routine dose of meningococcal conjugate vaccine at or after age 16 years do not need a booster dose**

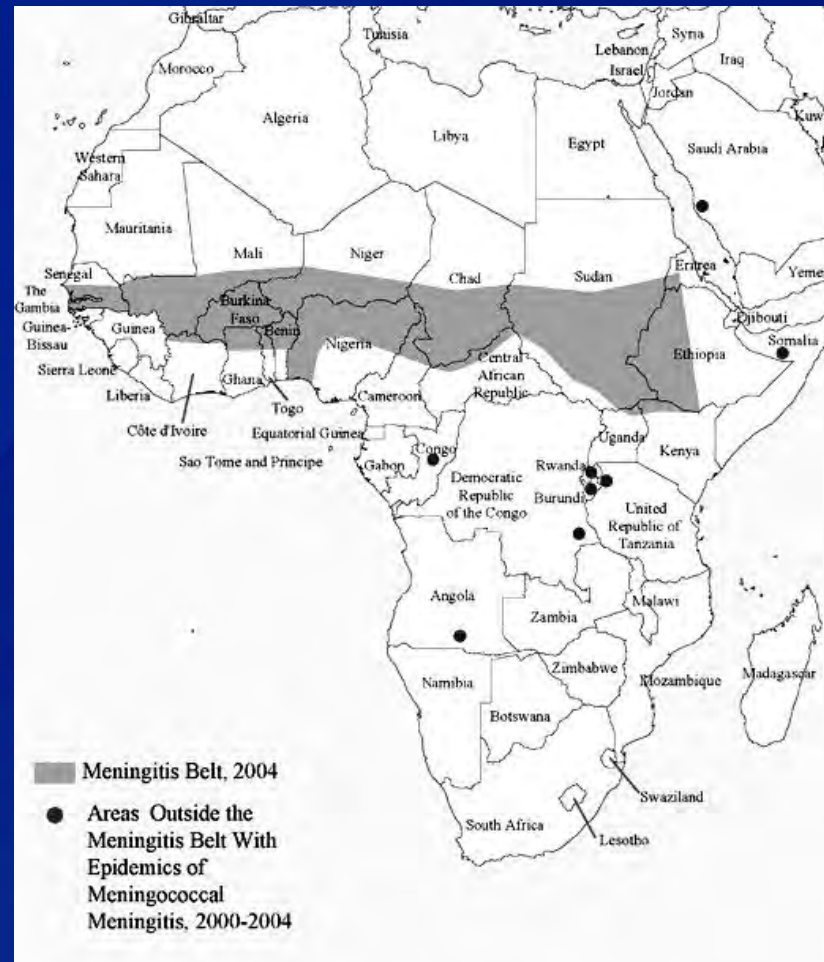
MCV4 Vaccination Recommendations

- ❑ **Administer 2 doses of MCV4 at least 8 weeks apart to persons with persistent complement component deficiency and anatomic or functional asplenia, and 1 dose every 5 years thereafter**

MCV4 Vaccination Recommendations

- ❑ **Meningococcal vaccination is recommended for persons at increased risk for meningococcal disease**
 - microbiologists who are routinely exposed to isolates of *N. meningitidis*
 - military recruits
 - persons who travel to and U.S. citizens who reside in countries in which *N. meningitidis* is hyperendemic or epidemic
- ❑ **Revaccinate every 5 years as long as the person remains at increased risk**

Meningococcal Endemic Areas 2004



MCV4 Vaccination Recommendations

- ❑ HIV infection is not currently an indication for MCV4 vaccination**
- ❑ Some persons with HIV infection should receive MCV4 for other indications, such as adolescents or international travel**
- ❑ Persons with HIV infection who are vaccinated with MCV4 should receive 2 doses at least 8 weeks apart**

MCV4 Vaccination Recommendations

- ❑ **ACIP defines high-risk children age 9 through 23 months as:**
 - persistent complement component deficiency
 - in a community or institution where a meningococcal disease outbreak is occurring, or
 - residing in or traveling to an area of the world where meningococcal disease is epidemic
- ❑ **High-risk children 9 through 23 months of age**
 - 2-dose series of Menactra
 - 3-month interval between doses
 - administer at 9 and 12 months of age

MCV4 Vaccination Recommendations

- ❑ High-risk children 9 through 23 months of age who need protection prior to international travel can receive the second dose as early as 2 months after the first dose**
- ❑ The recommended minimum age for MCV4 vaccination of children with asplenia or sickle cell disease is 2 years**
- ❑ For children who remain at risk, booster dose 3 years after primary series**

Meningococcal Vaccine Recommendations

- ❑ **Both MCV and MPSV recommended for control of outbreaks caused by vaccine-preventable serogroups**
- ❑ **Outbreak definition:**
 - 3 or more confirmed or probable primary cases
 - Period <3 months
 - Primary attack rate >10 cases per 100,000 population*

*Population based rates should be used rather than age-specific attack rates

Meningococcal Vaccines Contraindications and Precautions

- ❑ Severe allergic reaction to vaccine component or following prior dose of vaccine**
- ❑ Moderate or severe acute illness**
- ❑ A history of Guillain-Barre syndrome is no longer considered to be a precaution to MCV4 vaccination**

Meningococcal Vaccines Adverse Reactions

	MPSV	MCV
Local reactions for 1-2 days	4%-48%	11%-59%
Fever >100°F	3%	5%
Systemic reactions (headache, malaise fatigue)	3%-60%	4%-62%

CDC Vaccines and Immunization

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